Lesson Log-3/5/04
Day #1 Length of Class-83 min

What did you expect students to learn during the lesson? I expected the students to identify what activities could be affected by a damaged spinal cord. I also expected students to investigate the anatomy of the spinal cord and spinal column using the supplied website.
Students were to differentiate between white and grey matter. I expected the students to identify structures of the spinal cord and PNS from cross sectional diagrams. Students were asked to report their findings and hand them in as a "ticket to leave." I also expected students to begin to research their STS project and familiarize themselves with the projects goals and. requirements.
Describe the learning activities and the use of resources to support students' learning of the lessons' main concept and/or processes. Students were introduced to the unit concepts and STS project by first viewing the videotape "The Spine-Command Central", a *Science Screen Report* production. Students participated by taking notes. This video looked at the structure of the spinal cord, and how injuries affect movement. Important to the unit objective the video focused on current medical advances in treating spinal cord injuries. This video was twelve minutes long, but has many dramatic images; of persons living with spinal cord injuries (s.c.i) and undergoing physical therapy and using assistive technology. I stopped the tape to highlight both Functional Electrical Stimulation (FES) and the use of stem cell technology.
I asked the students if they knew of a famous person living with an s.c.i. Virtually everyone had some knowledge of what happened to Christopher Reeve. Following the videotape important vocabulary terms were listed on the board. Students copied these into their notebooks and used these to organize their reading for homework tonight. Using a "dry spine" anatomical model I showed the class the relationship between the spinal column and the spinal cord. I then used a PowerPoint type presentation, that included structural diagrams and cross sectional anatomy, to highlight the regions of the spinal cord. The requirements for the STS project "Spinal Cord Injuries and Society" were distributed, including a list of websites for the students to use as starting points for their investigations. We moved to the computer lab and students worked individually using the "Neuroscience for kids" website to review the previously identified vocabulary terms, and spinal cord /column structures.
Describe how you monitored students' learning and what you found about their understanding of the lesson's main concepts. One of my students noted how she was shocked at how young the Injured people were that she saw in the videotape. I asked the class if they too were surprised by this and most said they were. This helped reinforce the concept that these injuries are most often seen in younger people who must face a long period of disability

following an injury. When reviewing the fact sheet on spinal cord injuries, students were confused by the medical terminology that organized the facts. After the PowerPoint presentation I brought the diagrams back up and called on students to identify the structures as part of their participation grade. Some students were confused by terms dorsal and ventral, and I clarified this immediately by reminding them of a shark's dorsal fin. Most of the students identified this as a structure on the back of the shark. The dorsal side of the spinal cord was put into context as being the side closest to the back.

Describe the instructional adjustments you made in response to your findings about students' learning needs during the lesson. The need to clarify the medical terminology was important. I used plain language to clarify the confusing terms. For example, ‘incidence’ was redefined as "How often it happens". Although the anatomical model was life size, I made the students pass it around. Every student was able to touch the model structures while viewing the pictures displayed on the SmartBoard. This helped address the issue that students were mixing terminology of cord and column. I used a wire molding in the computer lab as an example. The wires inside the wire molding were compared to the spinal cord and the hard plastic wire molding was related to the vertebrae and soft tissues of the spine. The diagrams used on the PowerPoint presentation as compared to their textbook and the website all had subtle differences. These differences were confusing to some students. I walked around the lab and made sure students were using the correct pages. During the investigative phase several students were wandering through the website. To make sure they were focusing on the pages I wanted them to view I displayed the appropriate pages through the projector for the whole class to see simultaneously. At this point I wrote several questions on the white board for students to answer using the website. I had originally designed the STS project to be done individually, but several students wanted to work together and asked me if they could. I allowed one group to work together on a poster, but I asked them to expand the poster size to 24x30 to compensate for the additional help they would have to finish the project.

March 5, 2004

Good work today! Keep this in your notebook

31 pair Spinal Nerves (PNS)

Spinal cord (CNS)

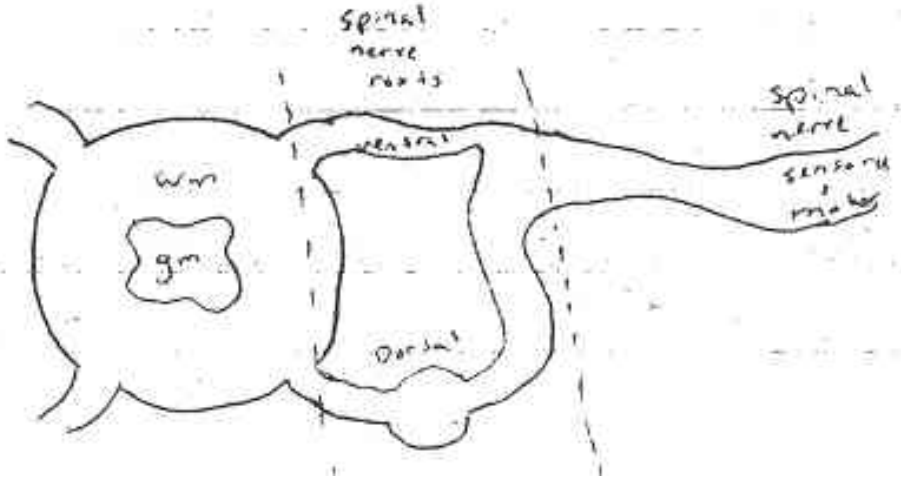
18" long / width of little finger

grey matter
- → cell bodies
- → dendrites
- → neuron

white matter
- → myelinated axons

information that travels from the body to the brain: sensory

information that travels from the brain to the body: motor



brain + spinal cord make up the CNS

spinal cord begins at the end of the brain and ends at the pelvis

There are 24 vertebrae, it protects the spinal cord. The vertebrae are connected by ligaments.

The disc in our back, absorbs shock, of walking, running, and swimming

The discs in the vertebrae prevent us from getting hurt

The inability to move a body part is called paralysis paralyzed from the waist down is paraplegic

There are protein in the body that prevents ~~[redacted]~~ nerve cells from growing back

Lesson Log-3/8/04
Day #2 Length of Class-46 min

What did you expect students to learn during the lesson? I expected them to learn about current controversy surrounding stem cell research including viewpoints of advocates for stem cell research. I expected students to be able to name the two divisions of the peripheral nervous system and describe their function. I wanted them to understand the role the sympathetic and parasympathetic nervous systems play in maintaining the human body, and coordinating its responses to the different situations encountered in life. We needed to review the structure of neurons and describe the transmission of impulses along a neuron.

Describe the learning activities and the use of resources to support students' learning of the lessons' main concept and/or processes. Due to the shortened period because of an assembly, students were handed an article to read as they entered class. It examined the controversy surrounding stem cell research and its strong advocate Christopher Reeve. I asked the students what their thoughts were on this issue. One student remarked that he was surprised to see that Mr. Reeve and the President were "fighting." I clarified that debate, argument and disagreement among adults while heated should not be confused with fighting. A student offered that she could understand his frustration at being disabled and hoped that research would be able to proceed soon. After this short debate I led the class through a PowerPoint presentation which outlined the organization of the peripheral nervous system. We defined the PNS as including the somatic and autonomic nervous systems. One student asked the question "I thought we only had one nervous system." I explained that is true, but biologists use these terms to identify the functions of different parts of the overall nervous system. We identified two roles of the somatic nervous system including voluntary and involuntary (reflex) movements. I showed the students a reflex hammer and asked them it they had ever seen one before. They all had and several students knew that it was used to test reflexes. I agreed, and then told them that the reflex is a window into how well the involuntary part of the somatic nervous system works. The autonomic nervous system was identified by the functions it coordinates in the human body. The sympathetic nervous system was identified by how it works to prepare the body for defense or to run from trouble. In addition I showed on a diagram where the sympathetic nervous system enters and leaves the spinal cord and how this part of our nervous system could be affected by a spinal cord injury. I asked students to answer questions on an "exit card" to measure their understanding of today's

concepts. I found that even with a motivated group such as this that making the exit card a graded assignment seemed to insure participation. I asked students to assemble an apparatus by hooking a tube to a funnel, and pour a volume of water through it. Two different diameter tubes were supplied to each group. I had the students pour a volume of water into the model. The model included two different diameter tubes to show axons of different diameter. The students timed how long it took for the water to pass though the tubes. I had the students display their data on the board. This was done to reinforce the concept that large diameter axons transmit impulses faster than smaller axons.

Describe how you monitored students' learning and what you found about their understanding of the lesson's main concepts. Terminology in this section can be confusing as the terms sympathetic and parasympathetic are close but mean vastly different things. I gave many hypothetical situations to the class including being asked to give a speech in front of the whole school and performing in a school play. Students answered by identifying each situation as being a sympathetic or parasympathetic "event". During the activity I circulated around the room and asked individual students to demonstrate what they observed with the activity. I asked students to compare the model to a neuron and what neuron structure the tube is analogous to. Most students were able to correctly identify the tube as being a model of an axon. Some even offered that the funnel was like the dendrite and cell body of a neuron collecting information and passing it on. After the activity I allowed these students to tell the class their findings and one offered to draw the model on the board. I challenged him to identify the different parts of the model with the names of neuron structures based on their function. I had the students copy this into their notes. The activity groups displayed their time data on the board, and we came to the conclusion that larger axons probably conduct impulses faster because of less resistance.

Describe the instructional adjustments you made in response to your findings about students' learning needs during the lesson. The article that the students read did not include the viewpoints of those opposed to embryonic stem cell research. I supplied this information to the students, by displaying an image on the SmartBoard of a news article which outlined President Bush's objections to stem cell research. During the activity some students got conflicting data based on how fast they poured the water into the funnel. I had to remind the class that the entire volume of water must be dumped into the funnel as quickly as possible to limit experimental error.

9/10 GOOD JOB TODAY!

Exit Card 3/8/04 10 points +1

11

Suppose you find yourself hiking Mt. Adams in New Hampshire and you come around a corner and find yourself face to face with a huge Black Bear! What part of your PNS will allow your body to react to and prepare to deal with this potential threat? How does this division of the PNS assist us in these types of situations? (3 points) The sympathetic system because when you feel a threat of physical attack, this system will redirect the blood flow to your heart and skeletal muscles

+2

WHY IS IT IMPORTANT TO HAVE YOUR SKELETAL MUSCLES READY? BE AWARE OF FIGHT! BECAUSE YOU HAVE TO

Considering the situation in question 1, in what region of the spinal cord would you be able to measure increased neuron activity? Why? How could a spinal lesion at the level of T5 or above affect the Sympathetic branch of the Nervous System (3 Points) T1 - L2. The neurons would have to work harder because they send and transmit impulses to and from the brain.

+1.5

The nerves of the SYMPATHETIC N.S. would not be able to communicate with the BRAIN!

Sketch a diagram of the apparatus used in class to demonstrate speed of conduction in an axon, and explain its significance? (2 points)

+2

It shows us how fast smaller and larger axons conduct impulses.

GOOD!

What type of an axon conducts an impulse the fastest? How fast is the fastest conduction in an axon? What substance speeds up conduction through an axon? (2 points) The larger axon conducted the faster impulses. They can conduct a speed up to 200 mph. → 120 m/s The myelin sheath can speed up a ~~conduction~~ CONDUCTION through an axon.

+1.5

Bonus Point(1 point) Explain why you might blush if the person you like asks you to dance?

+2 Because when you get nervous, the sympathetic region transmits your blood to your heart and your heart beats faster and it flushes your face

GOOD

Lesson Log-3/9/04
Day #3 Length of Class-83 min

What did you expect students to learn during the lesson? I expected students to be able to trace the pathway of a spinal reflex. I also wanted students to learn that reflexes are involuntary and can occur faster than a reaction because they do not involve the impulse traveling to the brain. I also expected the students to learn that nerve impulses travel in one direction only and respond all or not at all. Students were expected to learn the terms of nerve impulse including threshold stimulus.

Describe the learning activities and the use of resources to support students' learning of the lessons' main concept and/or processes. I began class by having the students view "Telegraph Line" which is a short *"Schoolhouse Rock"* cartoon about the functions of the divisions of the nervous system. The class really responded well to this as it was very funny and gave a great summary of the somatic and autonomic nervous system. I displayed an image of a simple spinal reflex on the SmartBoard which showed the structures involved and the direction of the impulse. I then had students volunteer to demonstrate this by having them wear signs that corresponded to the parts of the reflex arc. One student was designated the sensory receptor, sensory neuron, interneuron, motor neuron. When the stimulus reached a demonstrator she was to extend her leg to demonstrate an exaggerated reflex. We used a foam ball to represent the stimulus and impulse as it traveled through the reflex arc. I had the students pass the ball in the correct order to demonstrate the pathway. Then we added an extra step -another student was designated the brain, and I had the students pass the impulse to the brain, who was located far away. This slowed down the whole process and allowed the students to view how including the brain can slow down the response to a stimulus. I asked students how this could have a negative effect if the object of reflexes is to protect the body. We then built a model using dominoes, tape and rulers. Each group of students taped eight dominoes to a ruler so that the dominoes were only attached on one side and they would only be able to fall in the same direction. We used this model to show how dominoes can model nerve impulses which can only travel in one direction along a neuron. Students were challenged to demonstrate stimuli to the dominoes that will not make them fall. Some creative students yelled at the dominoes, even insulted them. While amusing it did show that some stimuli do not result in a response. The dominoes would only fall when enough pressure was applied to a domino on one end to make it fall. I compared this to a threshold

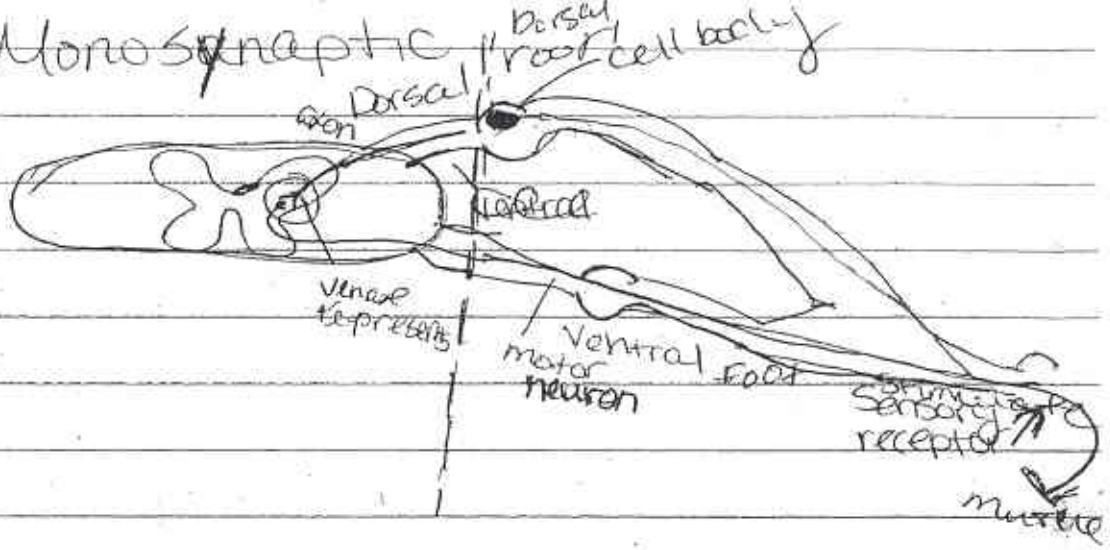
stimulus. Also, because they were taped together along a ruler, when one domino fell they all fell. This illustrated the *all or nothing* nature of neurons. We then modified the model to remove two dominoes to the center. When a stimulus was introduced and the dominoes fell, and the interruption in the chain meant that the remaining dominoes stayed up. I used this to show how an injured nerve tract or spinal cord impulses will travel to the site of the damage and then cannot be transmitted because a physical connection no longer exists.

Describe how you monitored students' learning and what you found about their understanding of the lesson's main concepts. I asked the students how having every impulse travel to the brain could have a bad effect on homeostasis. One student was able to use an example from the cartoon to explain this. She explained that in the cartoon the cook would have badly burned his hand if he did not react to the hot spoon in time and that the extra time to travel to the brain could have made the burn worse. One of the students explained that he saw the opposite of this in a recent "SpongeBob" cartoon. He described an episode of "Prehistoric SpongeBob" where one of the characters was not as highly evolved as the others and was too stupid to respond to having their hand in the fire. I asked him why he thought that was wrong, and at first he could not respond, so I asked a series of leading questions to get him to state that intelligence is a brain quality, but the brain is not always involved in protective reflexes. This was a teachable moment where I describe the Jendrassik maneuver. This is a way doctors distract the brain which can override reflexes. It allows the doctor to view reflexes which can be affected by people thinking about them.

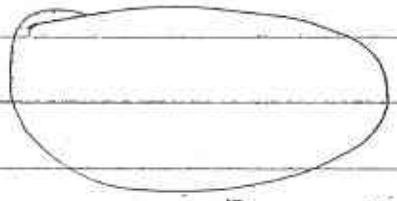
Describe the instructional adjustments you made in response to your findings about students' learning needs during the lesson. In this case the wrong example provided by the SpongeBob episode led to a teachable moment. I may try to acquire that episode and show it in future classes as an example and use it to contrast with the truth. There was confusion among the students as to how the brain can slow down the response to a stimulus. I reiterated that it is a function of time and distance and that even though our brain can work fast, sending an impulse to it takes time and can slow down our response to the environment. I had the demonstrator students perform the action again and drew attention to how it is the distance to the brain that slows down passing the stimulus. I had the students in the demonstration spread farther apart to mimic the extra distance the impulse has to travel to the brain.

3/9/04
Biology Notes
Block 2

Monosynaptic



ganglion - cluster of neuron of cell bodies



multisynaptic Dorsal Dorsal Root